

Challenges to MDG Achievement in Low Income Countries:

Lessons from Ghana and Honduras

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Abstract

This paper summarizes the policy lessons from applications of the Maquette for MDG Simulations (MAMS) model to two low income countries: Ghana and Honduras. Results show that costs of MDGs achievement could reach 10-13 percent of GDP by 2015, although, given the observed low productivity in the provision of social services, significant savings may be realized by improving efficiency. Sources of financing also matter: foreign aid inflows can reduce international competitiveness through real exchange appreciation,

while domestic financing can crowd out the private sector and slow poverty reduction. Spending a large share of a fixed budget on growth-enhancing infrastructure may mean sacrificing some human development, even if higher growth is usually associated with lower costs of social services. The pursuit of MDGs increases demand for skills: while this encourages higher educational attainments, in the short term this could lead to increased income inequality and a lower poverty elasticity of growth.

This paper—a product of the Development Economics Prospects Group—is part of a larger effort in the department to develop analytical tools for assessing the policy trade-offs of pursuing alternative poverty reduction and human development strategies. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at mbussolo@worldbank.org and dmedvedev@worldbank.org.

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Challenges to MDG Achievement in Low Income Countries: Lessons from Ghana and Honduras

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1 Introduction

The adoption of the UN Millennium Declaration in September 2000 has committed the international community to a broad vision of development that include not only higher incomes but also enhanced education and health levels, better access to water and sanitation and improvements of other human development (HD) objectives. Achieving by 2015 the ambitious set of the Millennium Development Goals (MDGs) is requiring efforts on multiple fronts.¹ First of all, new data collection and more systematic monitoring are necessary to assess the current situation and recent progress. Although poverty statistics exist for most developing countries, other social indicators – such as mortality, education completion rates, or access to basic services – are not always readily available. Secondly, once the ‘distance’ between the current situation and the various goals can be determined, the costs to cover that distance need to be calculated. Since different combinations of inputs can be utilized to reach the targets and costs depend on which combination is chosen, estimating these costs can be complicated.

In order to assess alternative MDG strategies, the World Bank has developed a framework for the empirical assessment of the costs and benefits of various MDG strategies: the Maquette for MDG Simulations (MAMS). To date, MAMS has been applied in about 30 countries in Latin America, Middle East, and Africa. It is a flexible analytical tool that can accommodate a wide variety of datasets and country-specific circumstances. The main advantages of MAMS include: explicit “production” of various MDG indicators, numerous links from HD service provision to the rest of the economy through the labor market and government budget constraints, and the recognition of potential positive spillovers when multiple MDGs are targeted at the same time.

The objective of this paper is to illustrate these features of the MAMS model and to delineate some general policy lessons by drawing on two recent applications of MAMS to Ghana and Honduras.² Five main messages emerge from this analysis. The first is that full MDG achievement is unlikely without a large scale-up of resources, and progress is likely to be uneven across the different goals. The second is that the choice of financing mechanisms—foreign grants, borrowing, taxation—has significant implications for macroeconomic performance and poverty reduction. The third message is that the overall growth environment is key to both poverty reduction and achievement of the non-poverty MDGs, as faster growth increases demand for HD services and creates incentives for attaining higher educational levels. Fourth, scaling up aid (or mobilizing domestic

¹ At the UN Millennium Summit of 2000, the world’s leaders agreed on the following targets for 2015:

1. Halving poverty and hunger rates (relative to the 1990 rates);
2. Achieving universal primary education;
3. Eliminating gender disparity in education;
4. Reducing by two thirds the under-five child mortality rate (relative to the 1990 rate);
5. Reducing by three quarters the maternal mortality rate (relative to the 1990 rates);
6. Reversing the spread of HIV/AIDS, malaria and other major diseases;
7. Halving the population shares without sustainable access to safe water and improved sanitation (relative to the 1990 rates);
8. Developing a global partnership for development.

² These applications are available as stand-alone studies—Bussolo and Medvedev (2007) for Ghana and Bussolo and Medvedev (2006) for Honduras—and address broader sets of issues than what is covered in this paper.

resources) is not the only way of reaching the MDGs, as significant cost savings can be realized from improving efficiency in the public sector service delivery. Finally, efforts to reach the MDGs can have important distributional effects by increasing skill premia and raising inequality.

The structure of this paper is as follows. Section 2 provides a brief summary of MAMS and discusses the main policy-relevant features of the model. Section 3 gives a detailed assessment of the main lessons learned from MAMS applications in Ghana and Honduras. Section 4 offers concluding remarks.

2 The MAMS modeling framework

Devarajan et al (2002) appropriately warn that: “any attempt to determine the aggregate costs of achieving the development goals is a highly speculative exercise”. Among others, two major obstacles need to be overcome: most MDGs tend to be jointly produced and future income growth rates and progress on the MDGs are both endogenous. In other words, interventions that further a given MDG are often likely to promote other MDGs and ‘double counting’ of costs can be an issue. For example, expenditures specifically aimed at improving the health of the young will help reduce child mortality but they may also improve the ability of kids to learn at school and thus promote the achievement of the education MDG.³ The second obstacle consists of the simultaneous determination of economic growth and progress on social MDGs. Future growth rates are not only difficult to forecast but are also important determinants of the cost of achieving the MDGs. Future input prices, wages, exchange rates may be quite different in a fast growing economy vis-à-vis those in a slow growing one. On the other hand, improved health and educational outcomes can increase productivity and support higher growth rates.

No existing approach completely resolves these issues and policy makers should be aware of these limitations when using current cost estimates. MDGs costing methodologies can be classified in two main groups: bottom-up costing and economy-wide modeling. The stylized analytical steps of bottom-up costing consist of: a) determining needed “physical” inputs – investments, labor (at different skill levels), intermediate inputs – for each MDG; b) computing costs of providing inputs using projected or current prices, wages, and exchange rates; c) assigning costs to different agents (government, private sector, NGOs, others).⁴ This method has some clear advantages: it is quite transparent, not very technically intensive and it is based on micro evidence. However it has some problems, too. Physical input needs by MDG are not well-defined – different combinations of the determinants can achieve the objective; MDG-specific inputs cannot be identified since some inputs contribute, directly or indirectly, to more than one MDG; and finally, marginal returns to inputs may vary depending on the value for the MDG indicator. In addition the bottom-up costing does not consider that the scaling up effort to expand social service provision may crowd out private activity and in certain cases reduce overall economic growth. This in turn can negatively influence the achievement of the goals and increase costs.

³ See, for example, Paxson and Schady (2005), who show that children with lower hemoglobin levels perform worse on tests with a sample of 3,000 predominantly poor pre-school age children in Ecuador.

⁴ See, for example, UN Millennium Project (2005), and the task force reports referenced therein.

Economy-wide modeling (normally in the form of Computable General Equilibrium - CGE models) avoids these problems by explicitly accounting for the direct and indirect effects generated by the pursuit of MDGs. For most poor countries, the increased government current and capital spending on education, health and other basic services – and its connected financing via foreign grants, taxation or borrowing – represent major economic shocks with uneven repercussions across sectors of the economy, its labor markets, its trade performance and so on. Even with these advantages, two major limitations of current CGE models are that they normally aggregate public expenditures into a single category and do not explicitly account for the output side of government spending. As a large theoretical and empirical literature has pointed out, public spending on infrastructure, health, and education can stimulate growth by improving the marginal productivity of the private sector's physical capital and labor.⁵ Therefore, detailed accounting of these types of spending is a desirable feature of a model aiming at assessing alternative policies for MDGs attainment.

MAMS, the Maquette for MDG Simulations, is a dynamic general equilibrium model which explicitly links public expenditures on individual social services and infrastructure to social outcomes in terms of MDG attainments and aggregate growth.⁶ A key objective of MAMS is to capture the main interactions between the pursuit of the MDGs and the evolution of the economy. The model explicitly incorporates the following HD targets: universal primary school completion (MDG 2), reduced under-five and maternal mortality rates (MDGs 4 and 5), and increased access to improved water sources and sanitation (part of MDG 7). To the extent that a package of interventions that curtails child and maternal mortality helps to reduce the incidence of major diseases including HIV/AIDS, the model also implicitly tracks MDG 6. In addition, achievements in terms of poverty reduction (MDG 1) are monitored, although the model does not contain mechanisms for specific MDG 1-related interventions.⁷

Production of a typical MDG is modeled as a nested system of two functions.⁸ At the bottom level of the MDG production nest, the model computes an aggregate measure of MDG service delivery by taking into account public and private expenditure on MDG services, availability of infrastructure services, positive spillovers from progress on other

⁵ See, for example, Calderon and Servén (2004) and Romp and de Haan (2005) for evidence on links between infrastructure and growth, Baldacci et al (2004) for empirical support of links between education and health spending and growth, and Agenor and Moreno-Dodson (2006), as well as studies cited therein, for evidence on interaction and mutual reinforcement of public infrastructure, health, and education.

⁶ See Bourguignon et al (2007) for a detailed description of the model and Lofgren and Diaz-Bonilla (2006) for technical documentation.

⁷ Of the 8 MDGs in the 2000 Millennium Declaration, only two are completely left out of the current version of the model: MDG 3 – promote gender equality and empower women and MDG 8 – develop a global partnership for development. The choice of MDGs to be included in the model is driven not by any priors regarding which goals are likely to be more costly and have a more pronounced impact on the real economy, but rather by the availability of data and the existence of quantitative MDG indicators. Thus, the “reverse loss of environmental resources” and “significantly improve the lives of slum dwellers” objectives are left out of our analysis of MDG 7 because no numerical criteria have been established for reaching these targets. The same is true for all aspects of MDG 8. On the other hand, the current version of MAMS does not consider MDG 3 and the hunger aspect of MDG 1 due to difficulties in obtaining the needed data.

⁸ The modeling of the education MDG is more complex because student achievement is tracked year by year, and the length of the primary education cycle is taken into account when calculating completion rates.

MDGs, and demand-side effects (see Table 1). Expansion of per capita service delivery requires increased commitments of three broad categories of inputs: labor (which is disaggregated according to skill/education levels), capital and intermediate goods. In addition to these inputs, which account for spending on specific MDG interventions, the aggregate measure of MDG service delivery is also determined by complementary policies. For example, reaching the education MDG requires additional schooling services, but is also facilitated by improvements in health conditions (proxied by MDGs 4 and 5), by better infrastructure (e.g., better roads to schools), by higher income levels (better-off parents may not need their children to work), and by good returns to education (proxied by the wage premium paid to skilled workers). The aggregate measure is strictly increasing in all of its components, and does not capture potential bottlenecks and/or the decreasing returns to scale as the target approaches (due to the difficulty of reaching the most remote parts of the population or, for example, necessity of high-level medical care to reduce maternal mortality beyond a certain threshold). In order to account for these effects, the top level of the MDG production nest links this aggregate measure of MDG service delivery to actual MDG outcomes by requiring greater and greater improvements in the former for the same rate of improvement in the latter.⁹

Table 1: Determinants of MDG Achievement in MAMS

MDG	Other Determinants				
	Per-capita Service Delivery	Per-capita consumption	Wage incentives	Public infrastructure	Other MDGs
1 Poverty		X			
2 Education	X	X	X	X	4
4 Infant Mortality	X	X		X	7a,7b
5 Maternal Mortality	X	X		X	7a,7b
7a Access to Water	X	X		X	
7b Access to Sanitation	X	X		X	

In addition to being a key input in the production of MDGs, improvements in public infrastructure also contribute to overall growth by adding to the productivity of private activities. This means that real GDP growth—and, indirectly, poverty reduction—is partly influenced by government policies and in particular by its investment in infrastructure services (roads, ports, energy, etc). However, given the lack of consensus on the strength of this relationship and the non-linear relationship between growth and poverty reduction, the MAMS model does not include explicit policy instruments for targeting the achievement of MDG 1. Instead, the model is capable of tracking the progress on poverty reduction by means of several alternative methods. A simple option is to use an estimated elasticity of poverty reduction with respect to growth in households' per capita consumption. A more sophisticated approach (and one that is utilized in the case studies considered in this paper) is to rely on a macro-micro framework where a set of aggregate results from MAMS are passed on to household survey data by means of a micro-simulation module.¹⁰ The simulations involve applying changes in employment, skill levels, relative wages, and consumption per capita from

⁹ This is accomplished by using a logistic function with the MDG outcome as a dependent variable and the aggregate measure of MDG service delivery as an independent variable.

¹⁰ This approach follows the methodologies developed in Bourguignon and Pereira da Silva (2003), Chen and Ravallion (2003), and Bussolo et al (2005).

MAMS to each individual (or household) in the survey, which produces a new distribution of income and translates the evolution of macro variables into poverty and inequality outcomes. Although significantly more data-intensive than the simpler poverty elasticity-based method, the micro-simulation approach allows for a wider range of mechanisms for escaping poverty, including moving from agricultural employment to non-farm activities where the wages tend to be higher, upgrading individual skills (through schooling), changes in relative wages, and an economy-wide growth component that equally benefits all households.

3 Policy lessons from MAMS work

3.1 Millennium Development Goals for Honduras and Ghana: current achievements and forthcoming challenges

The first important message that emerges from a quantitative assessment of the MDG situation in the two countries under study is that performance on individual goals varies substantially. Given the initial situation and the likely public expenditure trends over the next decade, progress towards MDGs is likely to be uneven across the two countries. Thus, even if the overall total financing requirements are broadly similar in Ghana and Honduras, the challenges facing Ghanaian and Honduran policy makers – as well as the strategies to overcome these challenges – reflect the specificity of each country's circumstances (see Table 2 and Table 3).

Table 2 Current MDG situation and baseline performance: Ghana and Honduras

	Honduras				Ghana			
	1990	2004	Distance 2015 covered (Target) in 'base'		1990	2004 (Target)	Distance 2015 covered (Target) in 'base'	
MDG 1: People living below the national poverty line (% of pop.)	84	64	42	28%	52	31	26	384%
MDG 2: Primary completion rate (% of relevant age group)	65	76	100	63%		47	100	76%
MDG 4: Under-five mortality rate (per 1,000 births)	59	31	20	16%	122	112	40	20%
MDG 5: Maternal mortality rate (per 100,000 live births)	180	108	70	17%	740	503	185	20%
MDG 7a: Access to an improved water source (% of population)	73	82	95	14%	54	56	85	21%
MDG 7b: Access to improved sanitation facilities (% of pop.)	66	77	95	15%	21	35	85	23%

Source: www.developmentgoals.org, www.sierp.hn, millenniumindicators.un.org, G-JAS (2007), AMCOW (2006).

Note: The table lists individual goals (2015 levels) as defined by national authorities, which may be more or less ambitious than the percentage improvements from 1990 levels which are used as the official definition by the UN.

In 2004, the base year for MAMS, Honduras seems in a better position than Ghana for all the MDGs. The Latin American country has recorded better achievements in terms of education, mortality rates, and population coverage for basic water and sanitation services.¹¹ However, this better initial situation does not necessarily mean that the 2015 targets are more easily reachable. In fact, since the targets are expressed as a relative improvements from the 1990 situation (apart from education where universal primary

¹¹ Notice that the poverty performance is difficult to compare because the national poverty lines differ across countries.

completion is a common threshold), the ‘distance’ that the two countries have to cover are comparable. The country specific challenges are thus determined by the progress that each country has made during the 1990-2004 period and, more importantly, by the sector costs needed to achieve the individual targets. These two elements – recent past progress and sector costs – are connected because, as mentioned above, getting closer to achieving a given goal often means rising costs. Providing social services to the poorest, most remote population groups, even if these are a small fraction of the total population, is usually complex and expensive.

In terms of the non-monetary poverty MDGs and starting with education, in Honduras, the rate of alphabetization of the young has increased from 79.7 percent in 1990 to 85.5 percent in 2001 and the enrollment rates for primary education have reached 89.3 percent in 2004. Moreover, there is no apparent gender gap, as the data for primary education shows boys and girls having almost identical access and completion rates. In Ghana, significant progress is taking place in basic education, aided by the recent (2005) abolition of basic school fees and enhanced expenditure allocation towards the lagging regions (G-JAS, 2007).

Table 3: Government spending required for reaching MDGs: Ghana and Honduras

Government Spending categories	Honduras		Ghana	
	Required average growth rates (2004-2015)	Gov. spending as share of GDP in 2004	Required average growth rates (2004-2015)	Gov. spending as share of GDP in 2004
Primary education	15.6	3.7	3.4	2.9
Health	11.7	2.8	18.6	2.9
Water and Sanitation	14.1	0.5	15.1	0.7
Total Government Expenditures		17.7		24.5

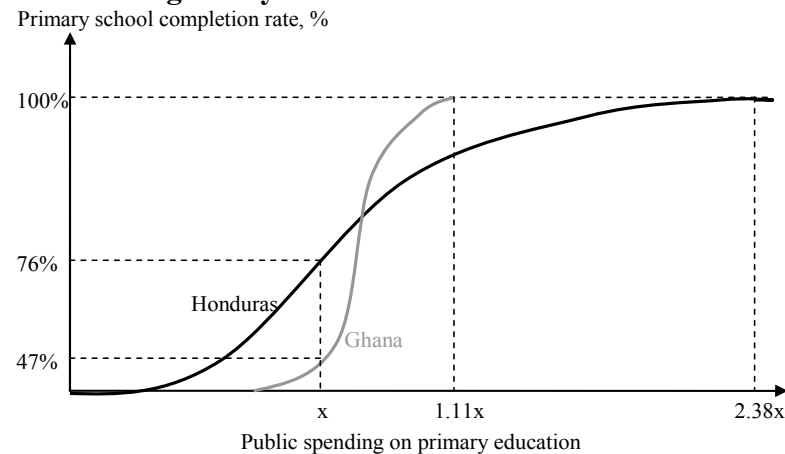
Note: Spending is valued in constant local currency. Growth rates in primary education are for the 2004-2010 period. Source: Government of Honduras (2005), AMCOW (2006), Government of Ghana (2003), World Bank staff estimates.

Although these developments in the education indicators exhibit clear positive trends, a number of studies have raised concerns about the quality of education received by Honduran and Ghanaian pupils and the efficiency of public education spending.¹² These common concerns are however reflected in quite different estimates of the cost of reaching universal primary completion by 2015. As shown in Table 3, although Honduras is already allocating close to 4 percent of GDP of its public expenditures to primary education, experts estimate that resource needs in this sector will grow at the average rate of 15.6 percent for the period 2004-2015. This contrasts markedly with Ghana that is spending about 3 percent of GDP on primary education and needs to expand its educational services by just 3.4 percent per year. Various factors may explain these stark differences: Honduras distribution of primary education attainments may be more unequal than that of Ghana meaning that reaching uncovered groups may be harder; inefficiencies in the primary school system may be more widespread and serious in the Latin American country; or it may use more intensively expensive resources such as

¹² For example, World Bank (2001) notes that Honduras ranked last in language and next-to-last in math in a study assessing language and math skills in the third and fourth grades for twelve Latin American countries. Also, World Bank (2004) found that the recent expansion in public spending on primary education was accompanied by declining efficiency.

highly qualified teachers.¹³ To incorporate the key feature of decreasing returns to spending as the goal approaches, MAMS uses logistic, S shaped, functions as shown in Figure 1. The ‘flatter’ logistic curve for the case of Honduras indicates that decreasing returns to spending in education are more severe and begin at lower completion rates than in the case of Ghana. This helps explain the counterintuitive situation where Honduras is closer to achieve its education goal but needs more resources than Ghana.

Figure 1: Honduras is closer to its primary education goal but reaching it may be costlier than in Ghana



Note: the point ‘x’ on the horizontal axis represents the current (2004) public spending on primary education, see values in terms of shares of GDP in Table 3. The points 1.11x and 2.38x represent the spending in 2010 (when every school aged child, in a 6 year primary cycle, has to enter and graduate from grade 1 in order to reach MDG2 by 2015) and are calculated as the compounded growth rates of Table 3; so for the case of Honduras: $2.38 = (1+0.156)^6$.

Similar arguments can be used to compare the health MDGs with the important difference that in this comparison Honduras is in a better position than Ghana. In Honduras, the under-five mortality rate decreased from 59 to 31 per thousand births and the infant mortality rate was reduced from 47 to 23 per thousand between 1990 and 2005/6. While data inadequacies do not permit a precise assessment of the evolution of maternal mortality, the available survey results suggest that considerable progress has been achieved: the maternal mortality rate was reduced from about 180 (per 100 thousand) in 1990 to around 108 in 2000.¹⁴ The rapid pace of reductions in infant and child mortality rates between 2001 and 2005/6 bodes well for the achievement of MDG 4, but continued progress is conditional on maintaining the recent growth of public health expenditures, which grew nearly four times as fast as real GDP between 1999 and 2005. If this growth is not sustained, additional inroads in improving health outcomes are likely to be minor (see, for example, chapter 7 of World Bank, 2007). In Ghana, efforts to reduce child and maternal mortality have practically stalled since 2003, which is even more worrisome since health sector expenditures have risen over the same period (G-JAS, 2007). The required additional resources to reach the health MDGs differ markedly

¹³ It is important to underline that MAMS relies on sector studies to assess the empirical strength of these factors and embeds them in its general equilibrium framework.

¹⁴ Surveys aimed at measuring maternal mortality rates were administered in 1990 and 1997, and the national statistical institute (INE) estimated the rate for the year 2000.

across the two countries reflecting these recent uneven performances and their associated expenditure patterns. Partial equilibrium estimates shown in Table 3 suggest that Honduras will need to increase its health services provision by 12 percent per year, while the comparable rate of increase in Ghana is close to 19 percent.

With regard to water and sanitation, Honduras' national coverage for potable water increased from 73 percent to 82 percent over 1990-2004, while sanitation coverage increased from 66 percent to 77 percent. However, large disparities in coverage rates are observed across rural and urban areas, and even across large and smaller cities. In addition, Honduras faces severe challenges in reaching its ambitious coverage rates on account of the high growth rate of its population and the low efficiency of sector institutions. According to official forecasts, reaching a 95 percent coverage rate for water and sanitation in 2015 (a goal which is above that set by the Millennium declaration) means providing access to water for an additional population of 2.6 million in total – 1.2 million in rural areas and 1.4 million in urban areas – and supplying sanitation services to an additional population of 3.5 million in total, distributed between 1.3 and 2.2 million in rural and urban areas respectively. In Ghana, although access to water and sanitation services has been improving, inequalities in access (particularly between rural and urban areas) and issues of quality in this sector remain a major bottleneck for development. Recent estimates suggest that the costs of inadequate water and sanitation facilities may be as high as 2.1 percent of GDP, indicating need for policy attention (G-JAS, 2007).

The above constraints determine the path of the MDGs in the baseline scenario for each country. These scenarios are based on the following assumptions. In Honduras, real GDP per capita grows at 1.8 percent per year; this coincides with growth projections of the IMF (2006) and Government of Honduras, but is much faster than the 0.5 percent average annual growth recorded over the 1990-2004 period. The level of government service provision in public infrastructure, water and sanitation, health, and education sectors is assumed to grow at the same rate as real GDP (3.9 percent per year). Spending in the general government sector is also set to grow exogenously at this rate, so that total public consumption grows at the rate of real GDP expansion in the projected period. In Ghana, per capita growth is expected to be much higher at 4.2 percent per year. Health and general government spending are assumed to grow at the same rate as real GDP (6.8 percent per year), while spending on education, water-sanitation, and infrastructure is set to grow at the expenditure rates planned by the government (4, 5.4, and 5.4 percent per year, respectively).

Even with these optimistic growth performances, none of the non-poverty MDGs is likely to be reached in Ghana or Honduras in the baseline case. In Ghana, the high and sustained pace of growth bodes well for reaching the poverty MDG, which is likely to be surpassed in the baseline scenario. Our estimates show that solid progress is likely to take place in education, where 87 percent of children will complete the primary cycle in 6 years. Although this falls short of the MDG of universal primary completion, more than 75 percent of distance to target is covered in the baseline scenario (see the last column of Table 2). In contrast, relatively little progress is likely to take place in water and sanitation, where only 21 and 23 percent of total distance to target will be covered in the baseline. Finally, reductions in child and maternal mortality are even slower, with one-fifth of the required improvement likely to take place by 2015. In Honduras, given the

high rates of growth of service provision required to reach the MDGs and the slow growth assumed in the baseline for these same services, it is not surprising that the distance towards the goals covered in the baseline scenario is less than in the case of Ghana. The largest improvement, 63 percent of the distance to target, is observed for the education goal¹⁵, while progress towards health, water-sanitation, and poverty goals is much slower. Only 16 and 17 percent of the distance to target is covered for the child and maternal mortality goals, respectively, while water and sanitation fare slightly worse at 14 and 15 percent of total distance covered. Finally, the baseline improvement in the poverty headcount is 28 percent of the total distance to target. That is, the 1.8 percent per capita income growth generated in the baseline scenario is not sufficient to make major progress in poverty reduction.¹⁶

The modest achievements of the baseline scenario signal the need of increasing the efforts to expand public provision of MDG-related services. Table 3 showed estimates of how much is needed to reach each individual MDG under the restrictions that synergies and general equilibrium effects are not accounted. The next session addresses the question of the costs to reach all the MDGs when these restrictions are removed.

3.2 How much will it cost to reach the MDGs?

The second important message emerging from analyzing the MDGs challenge is that – notwithstanding the differences across Ghana and Honduras with respect to individual goals – the overall costs to achieve all the non-poverty MDGs are quite large for both countries, reaching 10 -13 percent of GDP in 2015. Generally, there are two broad strategies for scaling up resources for MDG achievement: a) increasing spending with the current unchanged ‘production structure’ or b) combining lower increase in additional spending with a more efficient production structure. Although this second strategy of mixed additional spending and improved efficiency is more realistic, it is useful to determine the total cost in a situation with no productivity improvements. This approach helps establish the size of the challenge, and also highlights the potential magnitudes of structural impacts on the host economy, including implications for labor markets and government fiscal space.

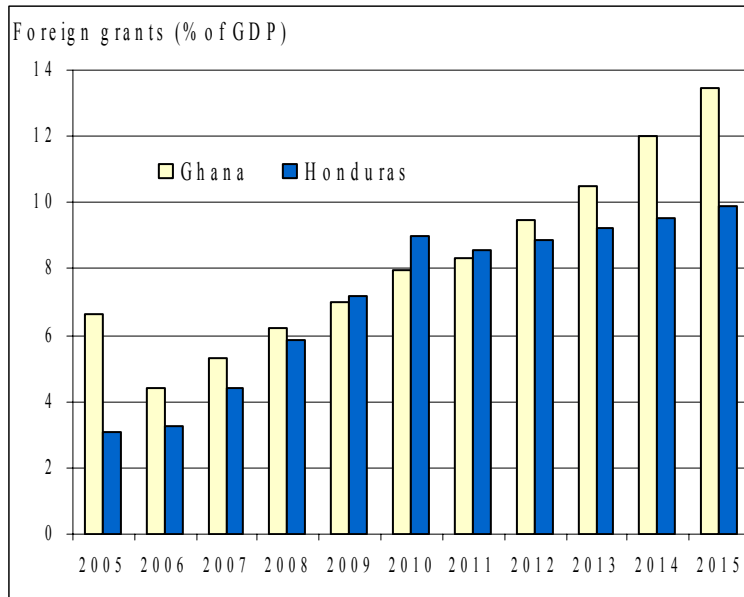
In order to reach the full set of non-poverty MDGs, the growth in HD service delivery per capita (excluding the provision of public infrastructure) in Ghana would have to nearly triple from 2.0 percent per year in the baseline to 5.7 percent per year. The growth in per capita MDG service delivery in Honduras would need to accelerate in a similar fashion, rising from 1.8 percent per year to 7.1 percent per year. Assuming for simplicity that the financing gap is filled by foreign grants, the total cost of providing these services in Ghana is likely to reach US\$16.2 billion over the 2004-2015 period, while the

¹⁵ In the case of education even if Honduras has to spend much more than Ghana (see Table 3), the distance to the common 100 percent completion target is much shorter for Honduras than for Ghana.

¹⁶ The baseline poverty reduction is modest due to increasing inequality between 2004 and 2015. The Gini coefficient rises by 0.7 percentage points, while the Theil index increases from 0.69 to 0.72. The trend towards rising inequality is explained by higher demand for skilled and tertiary-skilled workers, which drives up their labor earnings and increases wage inequality. Additionally, the wages of unskilled workers grow slower than the economy-wide average because of the demographic structure of Honduras, where large cohorts of young people enter the labor market at low skill levels.

comparable figure for Honduras is US\$9.2 billion.¹⁷ These results imply that by 2015, MDG-related foreign grants would need to rise by US\$101 per capita in Ghana and US\$139 per capita in Honduras. Reflecting the increasing unit costs of service provision (as coverage of MDG services extends to parts of the population who are more difficult to reach, socially or geographically) as well as overall population growth, the required amounts of aid are likely to rise over time, reaching 13 percent of GDP in Ghana and 10 percent of GDP in Honduras (Figure 2).

Figure 2 Financing requirements to reach the MDGs are large, and rising over time



3.3 What are the implications of alternative financing mechanisms?

Although the required expansion in HD service provision does not depend on the choice of financing mechanism, the total costs (in local currency units or US\$) of providing these services can vary significantly across different financing scenarios. Besides foreign grants, the MDG financing gap can also be filled by raising taxes, or through foreign or domestic borrowing. It is also possible, and even likely, that an MDG achievement strategy would rely on a combination of these approaches but, for simplicity, we consider each of them separately.

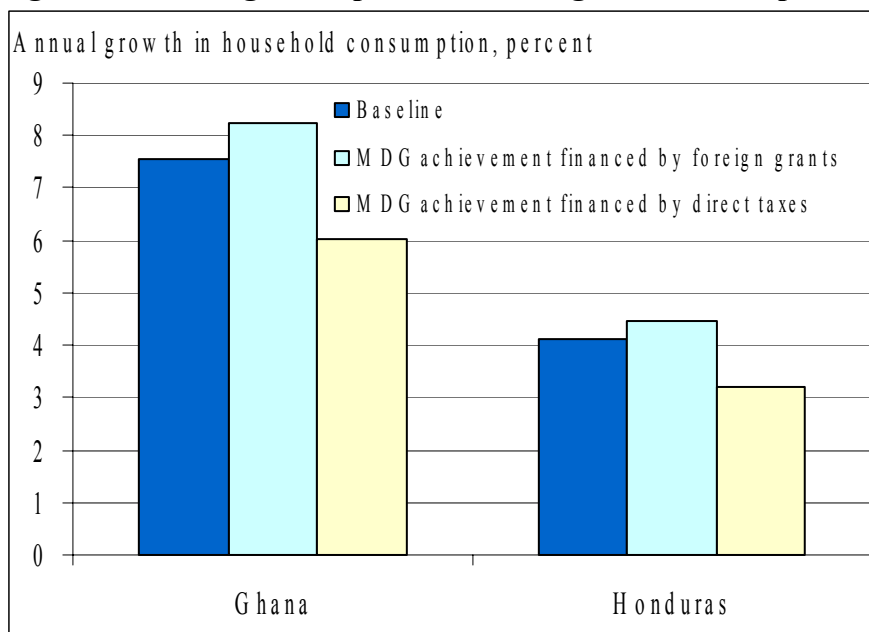
If the MDGs are financed through foreign aid, absorption of large inflows of foreign currency may be associated with real exchange rate appreciation and the Dutch disease problems that stem from it. In our simulations, both Honduras and Ghana experience a substantial appreciation of real exchange rate, by 12 and 14 percent over the 2004-2015 period, respectively. While the appreciation benefits the consumers of imported goods, it has two important drawbacks: first, the purchasing power of each dollar of foreign aid declines in step with the falling real exchange rate; and second, the growth rate of exports falls significantly below baseline levels. This potential loss of competitiveness on international markets is an important signal to policymakers that financing MDG

¹⁷ The implications of alternative financing scenarios will be considered in the following section.

activities through large amounts of foreign aid *and* focusing on export-led growth may not be compatible strategies.

The impact of MDG financing through foreign borrowing is similar to foreign grants, with the exception that the government fiscal space is further constrained by the necessity of making interest payments. Furthermore, accumulation of external debt may not be a welcome strategy in countries that only recently received reprieve from crippling external debt burdens through the HIPC initiative. As an alternative, governments may consider raising the required revenues domestically, either through domestic bond issues or increased taxation. However, doing so is likely to have adverse effects on private consumption (tax financing) or crowd out private investment (bond financing). For example, financing MDG expenditures through direct taxes in Honduras requires a near tripling of the 2015 tax rate from 5.5 percent to 14.8 percent. As a result, private consumption growth slows from 4.1 percent per year in the baseline to 3.2 percent in the tax scenario, and the 2015 poverty headcount in the tax simulation is 4 percentage points higher than in the baseline (Figure 3). If public expenditure on MDGs were to be financed exclusively through direct taxes, Honduras would only cover 12 percent of total distance to its poverty target between 2004 and 2015, compared with 28 percent in the baseline and 30 percent if the MDG financing were provided through foreign grants.

Figure 3 Financing HD expenditure through direct taxes penalizes consumption



The impact of tax financing in Ghana is similar, with consumption growth declining to 6.0 percent per year relative to 7.5 percent per year in the baseline and 8.2 percent per year if the MDGs were financed through foreign grants. Therefore, the progress on poverty reduction is also significantly reduced, although Ghana is still likely to be on track for meeting the MDG 1 due to the robust pace of growth anticipated over the next decade. Thus, the main message is not whether a given country is more or less likely to achieve the poverty targets—the progress on poverty reduction is largely determined by the baseline growth performance—but that the choice of financing mechanisms for MDG strategies has explicit costs: losing international competitiveness, penalizing private

consumption, or reducing private sector growth. Policymakers should be aware of these costs and weigh them carefully against the HD benefits of reaching the MDGs.

3.4 Income growth and MDG achievement: complements or substitutes?

A key feature of the MAMS model is that the costs of attaining the MDGs depend not only on the estimates by sector experts, but also on the availability of necessary resources (labor, capital, and intermediate inputs), complementary policies (e.g., provision of public infrastructure), and the overall growth environment of the country. Costs to reach the MDGs are likely to be lower when demand for services is higher, the contribution of the private sector is larger, and the requisite infrastructure is in place and of sufficient quality.¹⁸ At the same time, faster growth in the private sector is likely to drive up wages throughout the economy, therefore raising the costs of providing both HD and other public services for the government. The causality also runs the other way, as good MDG performance has important positive spillover effects on growth. For example, improvements in the schooling increase the share of skilled and tertiary-skilled workers in total employment, which in turn leads to higher average labor productivity.¹⁹

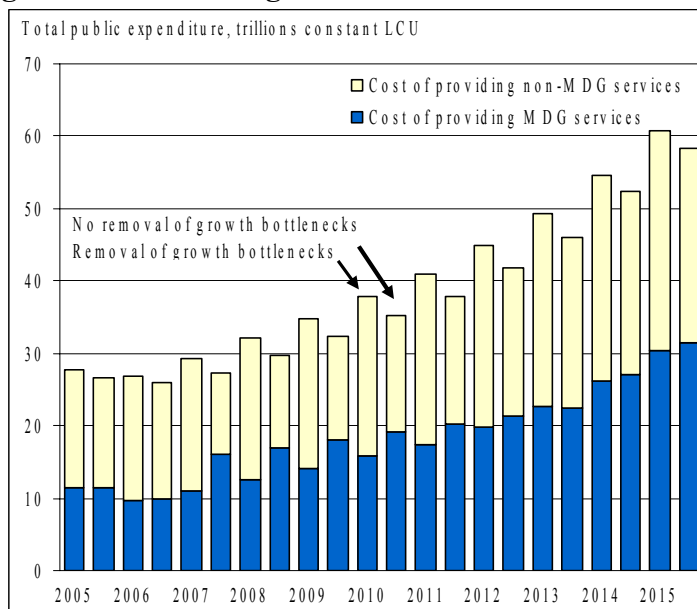
In order to illustrate the relationship between growth and achievement of the non-poverty MDGs, we consider a scenario where the government is able to accelerate growth by increasing investment in public infrastructure (including water and sanitation). In Ghana, this accelerated growth scenario—which addresses the infrastructure gaps that have constrained Ghana’s growth performance in the past by doubling the growth rate of public investment in infrastructure from 5.4 to 10.8 percent per year and implementing a similar increase in the growth rate of current spending in water and sanitation—quickens the growth rate of real GDP per capita to 4.6 percent per year, from 4.2 percent per year in the baseline. The accelerated growth simulation then serves as an alternative starting point for the effort to reach the MDGs; Figure 4 contrasts the total (current and capital) spending by the government under a MDG scenario that starts from the baseline (i.e., no removal of growth bottlenecks) and a MDG scenario that incorporates accelerated growth (i.e., removal of growth bottlenecks).

Figure 4 shows that while total public spending in the accelerated growth MDG scenario is always higher (due to additional investment in infrastructure), the HD expenditure is consistently lower. HD costs depend on the interaction of two factors. On the one hand, faster productivity growth in the private sector leads to higher wages, which then drive up the costs of reaching the MDGs. On the other hand, growth-enhancing investments in infrastructure reduce the costs of attaining the MDGs through positive spillovers and demand-side effects. Overall, the second set of factors outweighs the first and, in the accelerated growth scenario, the costs of reaching the MDGs are lower.

¹⁸ Note that both Ghana and Honduras applications do not include private provision of HD services.

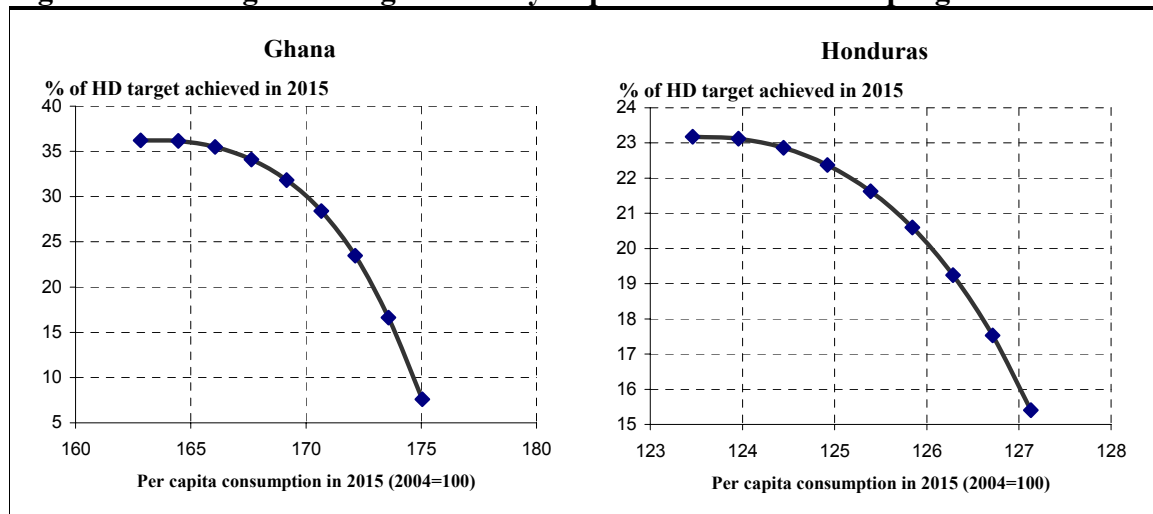
¹⁹ There exist other potential spillovers, such as higher labor productivity due to improved health of workers and higher survival rates of children who then go on to join the labor force. However, this possibility is not considered in the simulations presented in this paper due to the time scope of the analysis: improvements in child health are likely to translate into larger and healthier workforce with a time lag greater than the endpoint of our simulations (2015).

Figure 4 Accelerated growth results in substantial MDG cost savings in Ghana



While the previous discussion highlighted the many complementarities between MDG achievement strategies and growth, there also exist important trade-offs between HD- and growth-targeted activities. Faced with a fixed budget envelope, policymakers may not be able to raise sufficient resources to finance a full set of MDG activities and maintain adequate investments in infrastructure. In this case, one may broadly distinguish between investing in activities that are beneficial to growth (such as infrastructure) and activities that improve human development but that do not have immediate feedbacks on growth. In order to quantify this HD-growth trade-off, we undertake a series of simulations where the overall public budget is fixed at baseline levels, but the allocation of government resources varies from infrastructure-intensive to HD-intensive. The results of each simulation in terms of consumption growth and the average level of achievement of the non-poverty MDGs are then represented as points of a trade-off curve in Figure 5.

Figure 5 Investing more in growth may require sacrifices in HD progress

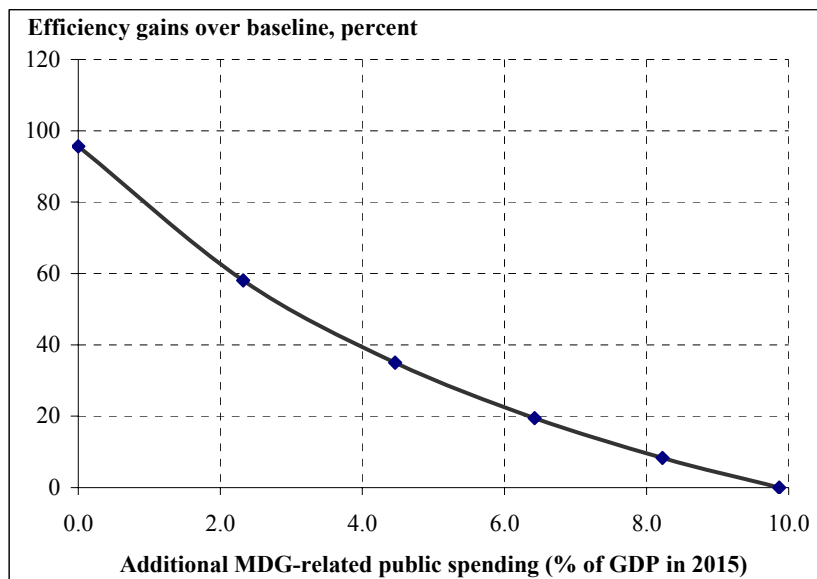


The trade-off curve is concave, implying that additional investment in either HD or infrastructure services results in progressively smaller improvements in the relevant indicators. Additionally, Bourguignon and Sundberg (2006) suggest that the trade-off between human development and growth becomes flatter as a country comes closer to achieving its HD targets. In other words, because the unit costs of reaching the most remote parts of the population (both economically and socially) are likely to rise as a country comes closer to the MDG targets, making the final steps towards the MDGs is much more costly in terms of foregone growth than when the MDG strategies are initially implemented.

3.5 What if the available MDG financing falls short of the required amounts?

If the total amount of MDG financing is constrained at some amount below the total requirements, improvements in the efficiency of service delivery may be required in order to assure that the targets are reached. Accordingly, higher levels of productivity in the HD sectors are likely to reduce the need for additional spending. A scenario of limited financing and increased efficiency in services provision is policy relevant in view of the large size of the additional public spending (required to achieve the MDGs in absence of efficiency gains) and in light of earlier observations on the apparently low efficiency performance in Honduras and Ghana.

Figure 6 MDGs in Honduras can be achieved by a combination of aid and efficiency gains



Assuming that the objective is to reach all the MDGs, the policy alternatives can thus be grouped in two categories: increasing the efficiency of public spending or increasing the amount of spending. For the same level of full MDG achievement, these two alternatives are shown as a policy trade-off curve in Figure 6 for the case of Honduras.²⁰ At one extreme of this tradeoff, the MDGs (excluding the poverty target) are attained

²⁰ Note that Figure 6 assumes that financing is provided by foreign grants. This figure over-simplifies the problem suggesting that the policy mix is two-dimensional. As discussed earlier, MDG attainment also depends on spending on infrastructure as well as the growth in household per capita income.

exclusively by scaling up MDG-related expenditures, while keeping efficiency constant at the baseline levels. As discussed earlier, this would require an increase in MDG-related spending by 10 percent of GDP by 2015. At the other extreme, the non-poverty MDGs are attained exclusively by improving efficiency, while keeping expenditures at the same levels as in the baseline scenario. In the MAMS model, the efficiency of public spending is entirely determined by labor productivity, and improvements in efficiency can be measured by the ratio of the productivity level in 2015 versus their level in the base year (2004). If the MDGs in Honduras are to be reached with no additional (grant-funded) spending, the overall productivity level would have to increase by 96 percent. This implies, for example, that the primary education MDG may be achieved with 52 percent fewer skilled workers and 40 percent fewer tertiary-skilled workers, while the comparable savings in health are 54 and 42 percent.

Finally, one can envision different combinations of efficiency and additional public spending amounts between the two extreme cases, each of which is sufficient to attain the MDGs. For example, if the level of foreign grants in Ghana is constrained to 40 percent of the amount needed, the overall level of public sector efficiency would need to rise by 45 percent relative to the 2004 levels. This means that in primary education, the same outcome could be achieved with 16 percent fewer teachers (relative to the foreign grant scenario), while in health, the MDGs could be reached with 19 percent fewer doctors. Overall, cost savings from increased efficiency in Ghana could amount to 9.7 billion USD between 2004 and 2015.

3.6 What are the effects of the pursuit of MDGs on the labor markets?

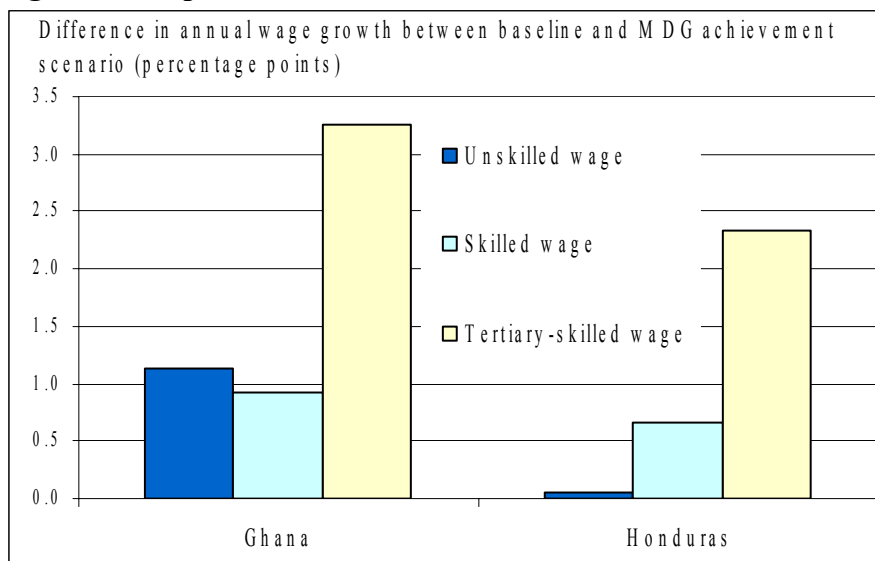
There are a number of links between MDG achievement strategies and labor market dynamics. On the one hand, in order to reach the MDGs, the public sector must hire more doctors, teachers, and engineers. This raises demand for skilled workers (increasing their wages and/or stimulating additional employment) at the economy-wide level and also limits the availability of skilled workers in the private sector. On the other hand, by the virtue of encouraging children and young adults to remain in school, the pursuit of MDGs boosts the supply of skilled workers relative to the baseline. Finally, there are important inter-temporal effects due to the length of the education cycle. During the transition phase when unskilled individuals choose to go to school rather than entering the labor market, the economy experiences a growth penalty of a smaller total labor force.²¹ During this phase, additional public spending in education is needed to offset the lower growth in consumption per capita. Obviously, a better educated labor force would contribute to stronger growth rates in the future. However, before reaching this new higher growth path, a country is faced with an important trade-off similar to that experienced by poor households who have to decide whether to send their young members to school and forego their incomes or get them to work but deprive them of potentially higher earnings in the future.

²¹ The Ghana and Honduras applications discussed in this paper do not allow for changes in labor force participation rates. As unskilled wages rise (because unskilled labor is relatively scarcer) more unskilled workers may choose to enter the labor force. However, this effect could be mitigated by difficulties in finding employment, which could include formal barriers to labor mobility (such as prohibitive hiring costs), specificity of human capital required for certain tasks, and location challenges (e.g. moving from remote rural areas to cities).

The effects described in the previous paragraph combine to produce the wage dynamics depicted in Figure 7. This figure plots the absolute differences in annual wage growth (expressed in percentage terms) for the three skill categories in Ghana and Honduras. The acceleration in growth of tertiary-skilled wages is directly attributable to the increased demand for high-level skills workers in the public sector, which more than compensates for the increased supply of these workers due to improvements in the education system. The reason is that the public sector in general, and MDG-related public services in particular, are much more skill-intensive than the rest of the economy. However, these wages increase economy-wide—meaning higher production costs for the whole economy—and can affect, together with other variables, macroeconomic performance.

The evolution of unskilled and skilled wages highlights important differences in the ability of the education sector to scale up for MDG achievement across the two countries. In Honduras, where the demographic distribution is heavily skewed towards younger age groups—almost 45 percent of the total population is 16 years old or younger—the secondary school system is unlikely to be able to absorb the large quantities of primary graduates without a significant scale up in financing. Since our simulations keep the growth in secondary and tertiary education financing the same as in the baseline, the quality of education in secondary schools deteriorates, discouraging primary graduates to continue their education. As a result, the growth rate of unskilled labor supply falls only slightly relative to baseline, and the increase in unskilled wage growth is negligible. In Ghana, the secondary school system is relatively well-positioned to absorb the higher quantities of primary school graduates (the result of reaching the MDG 2) without a significant deterioration in the quality of education. Therefore, large amounts of unskilled workers exit the labor force (the annual growth rate of unskilled labor declines from 2.1 percent per year in the baseline to 1.3 percent in the MDG scenario) and gradually return as skilled workers. As a result, unskilled labor becomes relatively scarcer and unskilled wage rise relative to baseline. On the other hand, although growth in skilled wages accelerates relative to baseline, the acceleration is muted by the increasing supply of these workers.

Figure 7 The pursuit of MDGs raises demand for skilled workers



The rising demand for skills and faster growth of skilled wages have important consequences for the distribution of income and poverty reduction. Growing wage differentials increase income inequality, which means that the bulk of the economy-wide gains are likely to accrue to individuals already earning incomes above the poverty lines (e.g., individuals with a tertiary education). This is one of the reasons why the MDG achievement scenarios fail to deliver more impressive poverty reduction. In Honduras, the headcount index in 2015 declines by less than one percentage point relative to the baseline, despite the 0.4 percent per year acceleration in consumption growth. This occurs because inequality also rises over the course of the same period, with the Gini coefficient increasing by 1.2 percentage points to 61, and the Theil index rising from 0.72 to 0.76. It is important to acknowledge that these results do not imply a “worsening” of income inequality because they are underpinned by rising premiums for education, which in the long term will encourage more children to attend school and potentially raise economy-wide productivity levels. At the same time, the results highlight the potential need for public safety nets to assist poor workers who are likely to gain the least under these policies.

4 Conclusions

The MAMS model is the first framework to explicitly take into account the general equilibrium consequences of scaling up for the achievement of MDGs. The MAMS approach consolidates the partial equilibrium assessments of the experts on education, health, infrastructure, and water; links the pursuit of MDGs to the labor markets, fiscal sustainability, and international competitiveness; and provides a consistent set of prices and volumes that can be used in a micro-simulation analysis of poverty and income distribution effects of MDG strategies. In this paper, we have illustrated the main features of MAMS and the policy lessons that could be learned from the model using two recent MAMS applications to Ghana and Honduras.

Our discussion draws attention to a number of potential areas for attention by policymakers. Our results show that the costs of reaching the MDGs in low-income countries such as Ghana and Honduras are likely to be large, reaching 10 and 12 percent of GDP by 2015, respectively. The choice of financing mechanisms for the MDG strategies has important consequences for the macroeconomic variables: foreign aid financing is likely to result in losses in international competitiveness and reduced export growth, while domestic financing is likely to crowd out private investment and slow the progress on poverty reduction. We show that while the overall growth environment is a key determinant of the total cost of reaching the MDGs, there are important public policy trade-offs between investing in growth-enhancing infrastructure or human development-intensive activities. Taking account of the low reported efficiency of public service provision in Ghana and Honduras, our simulations point to significant cost savings that could be achieved by improvements in productivity in the public provision of social services. Finally, the pursuit of MDGs is likely to increase demand for skilled workers faster than the education system is able to produce new graduates; although in the long term this will encourage more people to attend and remain in school through higher skill premiums, in the short term this policy could lead to increased income inequality and a lower poverty elasticity of growth.

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